Vehicle Tracing and Accident Management System

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***Abstract*— The main aim of the work is to design and develop an advanced vehicle tracing and management system in the real time environment. The user can send a STATUS message from his cell phone (POS) and as soon as the GSM module gets the message, it will immediately send the details of the locations like the latitude and the longitude using GPS module. So the user can get to know the exact location of the vehicle. In addition to that Whenever an accident occurs to the vehicle, it can be automatically known by the owner also an automatic horn can be blown by the vehicle as an indication of accident. For this purpose, we need to get a message. This will be sent to the owner of the vehicle or to his family members or concerned people by the GSM modem to the previously stored SIM numbers. These SIM numbers will be stored in the memory of the microcontroller. A message will be sent to these SIM numbers, which indicates an accident and also the area of occurrence in the form of latitudinal and longitudinal location apart from that we are using an intellectual mechanism in the kit so that it can indicate the population density in that area also. By viewing in the Google map, the area or name of the location can be traced out.**

Keywords- GPS (Global Positioning System); GSM (Global Service for Mobile Applications); SMS (Short Message Service); Microcontroller.

I. INTRODUCTION

Now days the vehicle theft rate has been increasing day by day, when compared to previous decade the theft rate has been increased by 54% in order to avoid this vehicle theft we have designed our work to provide security to the vehicles. Main aim of our work is to provide security to the vehicle in very reasonable cost so in this work we are using the basic microcontroller AT89C51for cost effective and also for easy understanding. In this work we used assembly programming for better accuracy. This work consist of GPS and GSM modules helps use to trace the vehicle anywhere on the globe. Here we are using American 24 standard satellite system which consist of space segment, user segment and control segment to trace the vehicle perfectly using triangulation method and here GSM is used to send the exact location of the vehicle to our remote devices (mobile phone).here we use heat sensor (thermostat) to measure the engine temperature which gives the exact information that our vehicle is motion or in rest. Here relay is connected to fuel tank and whenever we find that our vehicle is missing then we send lock command relay automatically on the fuel lock and the buzzer which is connected to the relay automatically beeps this will threatens the thief and it blows until we send the POS command and then it indicates the theft position.

By this work we can save our vehicles from theft and whenever an accident occurs, it can be automatically known by the owner or his family members or concerned persons. For this purpose, we need to get a message. This will be sent to the owner of the vehicle or to his family members or concerned people by the GSM modem to the previously stored SIM numbers. These SIM numbers will be stored in the memory of the microcontroller. A message will be sent to these SIM numbers, which indicates an accident and also the area of occurrence in the form of latitudinal and longitudinal location. By viewing in the Google map, the area or name of the location can be traced out. this work is implemented o microcontroller based GSM communication.

II. INTRODUCTION TO EMBEDDED SYSTEMS

Embedded System is a combination of hardwareand software used to achieve a single specific task. An embedded system is a microcontroller-based, software driven, reliable, real-time control system, autonomous, or human or network interactive, operating on diverse physical variables and in diverse environments and sold into a competitive and cost conscious market.

An embedded system is not a computer system that is used primarily for processing, not a software system on PC or UNIX, not a traditional business or scientific application. High-end embedded & lower end embedded systems. High-end embedded system - Generally 32, 64 Bit Controllers used with OS. Examples Personal Digital Assistant and Mobile phones etc .Lower end embedded systems. Examples Small controllers and devices in our everyday life like Washing Machine, Microwave Ovens, where they are embedded in.

III. BLOCK DIAGRAM

A. Explanation about block diagram

Here we have mainly two different blocks: those are tracking and location viewing Blocks, in this first we are going to know about tracking system. In this work we will place this vehicle tracking system in vehicle. The Block diagram consists of a GPS modem, a GSM modem, a Micro controller, a LCD display and power supply.

A GPS modem is used to get the signals and receive the signals from the satellites. In this work, GPS modem gets the signals from the satellites and those are given to the Micro Controller. The signals may be in the form of the coordinates; these are represented in form of the latitudes, longitudes and altitude.

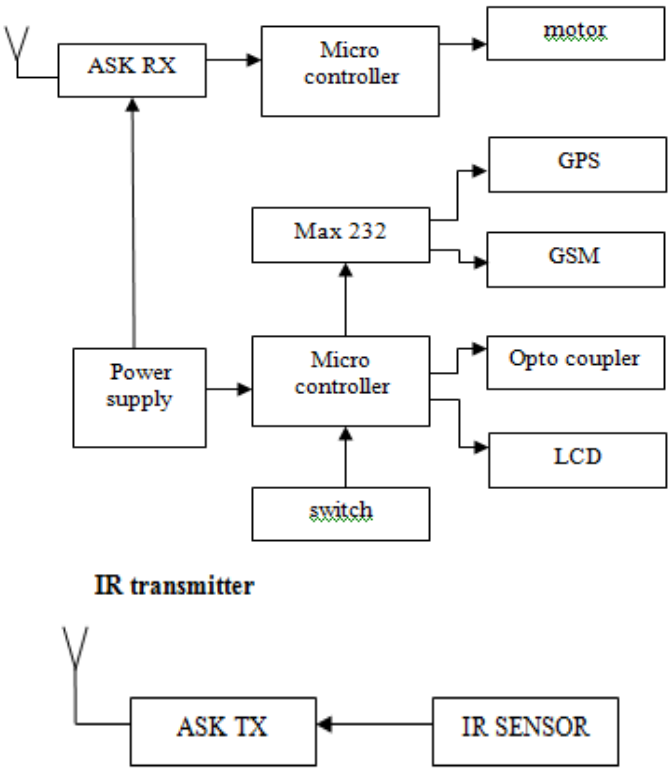

Figure 1. Block Diagram

A GSM modem is used to get the messages from the mobile as well as reading the message also. Before operating this GSM modem first we have to insert the SIM card in this modem. Then the total receiving and sending the messages will be done based on this number. In this system mainly we have microcontroller, power supply, LCD, GSM. A Micro controller is a heart of this work. The total controlling action will be done through this micro controller. Based on the signals given to the microcontroller it will be totally controlled at the output section. If we send the message like "POS" to the GSM modem at viewing section, it will get received by tracking section which is placed in the vehicle, it will send signals to the micro controller to track the vehicle. A LCD display is used at the output section. To display the status of the GSM and GPS. The maximum power supply required to operate the hardware circuitry is +5V DC voltage.

IV. CIRCUIT DIAGRAM

The hardware interfaces to the microcontroller are LCD display, GSM modem, GPS modem. When vehicle is in tracking mode, it indicates Location of the vehicle through GPS modem. A GSM Modem is used to send the position (Latitude and Longitude) of the vehicle from a remote place when vehicle will be stolen. The GPS locates the position of vehicle and transmit that data to the microcontroller. This data will be continuously transmitted to the GSM modem connected to the microcontroller. It automatically sends location of the vehicle to its owner as a SMS through GSM modem. An EEPROM is used to store the data received by the receiver. An LCD display is connected to the micro controller it displays Tracking information. The design uses RS-232 protocol for serial communication between the modems and the microcontroller. A serial driver IC is used for converting TTL voltage levels to RS-232 voltage levels.

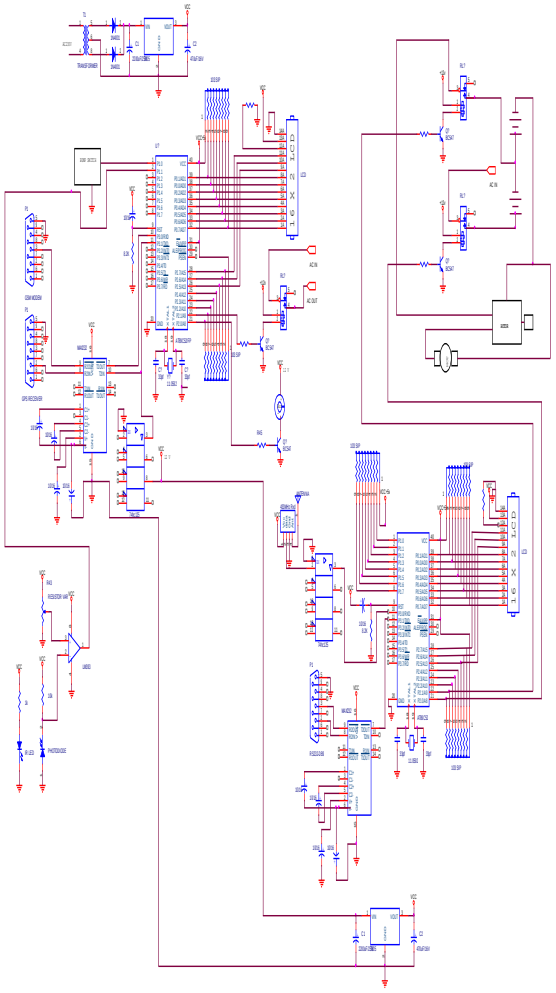

Figure 2. Circuit Diagram

A. *MICRO CONTROLLER*

The AT89C2051 is a low-voltage, high-performance CMOS 8-bit microcomputer with 2K bytes of Flash programmable and erasable read-only memory (PEROM). The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard MCS-51 instruction set. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C2051 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications.

The AT89C2051 provides the following standard features: 2K bytes of Flash, 128 bytes of RAM, 15 I/O lines, two 16-bit timer/counters, a five vector two-level interrupt architecture, a full duplex serial port, a precision analog comparator, on-chip oscillator and clock circuitry. In addition, the AT89C2051 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port and interrupt system to continue functioning. The power-down mode saves the RAM contents but freezes the oscillator disabling all other chip functions until the next hardware reset.

Port 0 : This is a dual-purpose port occupying pins 32 to 39 of the device. The port is an open-drain bidirectional I/O port with Schmitt trigger inputs. Pins that have 1swritten to them float and can be used as high-impedance inputs. The port may be used with external memory toprovide a

multiplexed address and data bus. In this application internal pull-ups are used when emitting 1s. The port also outputs the code bytes during EPROM programming. External pull-ups are necessary during program verification.

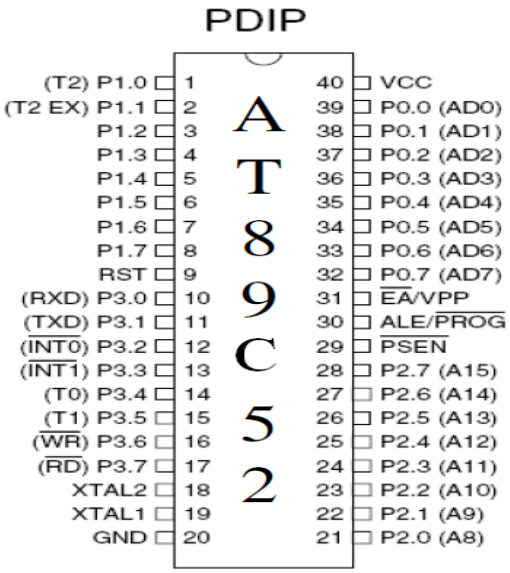

Figure 3. Pin Diagram

Port 1 The Port 1 is an 8-bit bi-directional I/O port. Port pins P1.2 to P1.7 provide internal pull-ups. P1.0 and P1.1 require external pull-ups. P1.0 and P1.1 also serve as the positive input (AIN0) and the negative input (AIN1), respectively, of the on-chip precision analog comparator. The Port 1 out-put buffers can sink 20 mA and can drive LED displays directly. When 1s are written to Port 1 pins, they can be used as inputs. When pins P1.2 to P1.7 are used as inputs and are externally pulled low, they will source current (IIL) because of the internal pull-ups. Port 1 also receives code data during Flash programming and verification.

Port 3 Port 3 pins P3.0 to P3.5, P3.7 are seven bi-directional I/O pins with internal pull-ups. P3.6 is hard-wired as an input to the output of the on-chip comparator and is not accessible as a general-purpose I/O pin. The Port 3 output buffers can sink 20 mA. When 1s are written to Port 3 pins they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 3 pins that are externally being pulled low will source current (IIL) because of the pull-ups. Port 3 also serves the functions of various special features of the AT89C2051 as listed below: Port 3 also receives some control signals for Flash programming and verification.

RST Reset input. All I/O pins are reset to 1s as soon as RST goes high. Holding the RST pin high for two machine cycles while the oscillator is running resets the device. Each machine cycle takes 12 oscillator or clock cycles.

XTAL1 Input to the inverting oscillator amplifier and input to the internal clock operating circuit. Port Pin Alternate Functions P3.0 RXD (serial input port) P3.1 TXD (serial output port) P3.2 INT0 (external interrupt 0) P3.3 INT1 (external interrupt 1) P3.4 T0 (timer 0 external input) P3.5 T1 (timer 1 external input)

XTAL2 Output from the inverting oscillator amplifier.

B. Global System For Mobile Applications(GSM)

Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz. A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves.

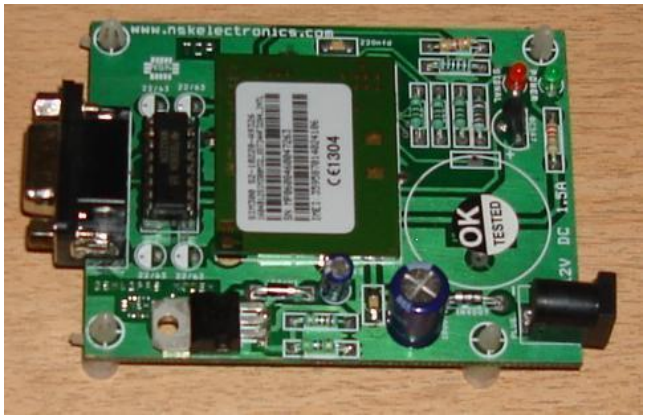

Figure 4. GSM MODEM

Here we use a micro controller which is of 8051 series. It has antenna which is in the form of wire. It has external slot for SIM allocation. We can keep any network SIM which is a GSM model. It needs an external power supply, which is given by using adaptor which supports 9v and 2A. It has two LED's for indication of power and network signaling respectively. Power LED emits light continuously. Network signaling LED, at starting blinks faster and after sometime it starts blinking slowly like single blink per minute. This indicates the SIM got signal according to its network. Then it can send message to any network.

C. Global Positioning System (G.P.S)

A satellite's position and pseudo range define a sphere, centered on the satellite, with radius equal to the pseudo range. The position of the receiver is somewhere on the surface of this sphere. Thus with four satellites, the indicated position of the GPS receiver is at or near the intersection of the surfaces of four spheres. In the ideal case of no errors, the GPS receiver would be at a precise intersection of the four surfaces. If the surfaces of two spheres intersect at more than one point, they intersect in a circle. For automobiles and other near-earth vehicles, the correct position of the GPS receiver is the intersection closest to the Earth's surface. For space vehicles, the intersection farthest from Earth is the correct one .The correct position for the GPS receiver is also on the intersection with the surface of the sphere corresponding to the fourth satellite

The above figure indicates the GPS MODEM. It is manufactured at Taiwan. It has antenna named as GPS ANTENNA which is connected externally. It also needs additional adaptor for power supply. The adaptor gives 9v and 2A. It consists of a switch for on and off purpose. The following figure shows the GPS antenna.

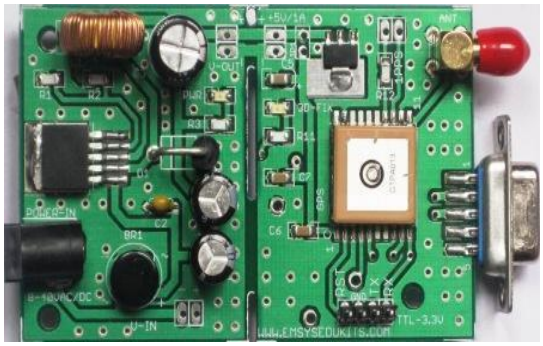

Figure 5. GPS MODEM

GPS is usable everywhere except where it is impossible to receive signals such as inside buildings, in caves and other subterranean location and under water. Various military weapons systems use GPS to track potential ground and air targets before flagging them as hostile. Downed pilots can be located faster if their position is known. Patrol movement can be managed more closely. Surveyors use absolute locations to make maps and determine property boundaries. Self-navigating, autonomous robots use GPS sensors, which calculate latitude, longitude, time, speed, and heading. It also provides digitally precise velocity and orientation measurements to navigators.

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D. MAX232

The MAX232 is an integrated circuit that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals. The drivers provide RS-232 voltage level outputs (approx. ± 7.5 V) from a single + 5 V supply via on-chip charge pumps and external capacitors. This makes it useful for implementing RS-232 in devices that otherwise do not need any voltages outside the 0 V to + 5 V range. The receivers reduce RS-232 inputs (which may be as high as ± 25 V), to standard 5 V TTL levels. . When a MAX232 IC receives a TTL level to convert, it changes a TTL Logic 0 to between +3 and +15 V, and changes TTL Logic 1 to between -3 to -15 V, and vice versa for converting from RS232 to TTL. This IC provides best noise rejection and very reliable against discharges and short circuits.

E. Liquid Crystal Display

To understand the operation of an LCD, it is easiest to trace the path of a light ray from the backlight to the user. The light source is usually located directly behind the LCD, and can use either LED or conventional fluorescent technology. From this source, the light ray will pass through a light polarizer to uniformly polarize the light. So it can be acted upon by the liquid crystal (LC) matrix. The light beam will then pass through the LC matrix, which will determine whether this pixel should be “on” or “off”. If the pixel is “on”, the liquid crystal cell is electrically activated, and the molecules in the liquid will align in a single direction. This will allow the light to pass through unchanged. If the pixel is “off”, the electric field is removed from the liquid, and the molecules with in scatter. This dramatically reduces the light that will pass through the display at that pixel.

Figure 6. Liquid Crystal Display

F. OPTO COUPLER

The OPTO coupler pairs are used for the purpose of measuring the density levels. The IR LED continuously emits IR rays and these are received by the photo diodes. This is considered as the normal case. Whenever there is an obstacle between the IR LED and photo diode, which are arranged on both sides of the road, the rays emitted by the IRLED cannot be received by the photo diode. This fluctuation will be observed and will be sent to the micro controller as an input from both the pair of opto couplers. Here, there are four cases of traffic density. When both the opto couplers pairs are blocked, it indicates much density of traffic. This is indicated with a specific binary value. When the first sensor from the vehicle is blocked and the second one is free, it indicates immediate clearance of traffic. So it is ignored but indicated with a separate set of binary values.AT89C2051 microcontroller is used for this purpose.

When the first sensor from the vehicle is free and second one is blocked, this indicates that there is some level of traffic and so this is indicated with some binary value which is programmed to indicate reduction of the speed When both the sensors are blocked, this indicates a heavy traffic and this is assigned with a separate set of binary value. These fluctuations and indications will be continuously transmitted through a transmitter which employs Automatic Shift Keying (ASK) Technique.

G. MOTOR

Every DC motor has six basic parts -- axle, rotor (a.k.a., armature), stator, commutator, field magnet(s), and brushes. In most common DC motors (and all that Beamers will see), the external magnetic field is produced by high-strength permanent magnets1. The stator is the stationary part of the motor -- this includes the motor casing, as well as two or more permanent magnet pole pieces. The rotor (together with the axle and attaché commutator) rotates with respect to the stator. The rotor consists of windings (generally on a core), the windings being electrically connected to the commutator.

In any electric motor, operation is based on simple electromagnetism. A current carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

V. ACCIDENT DETECTION

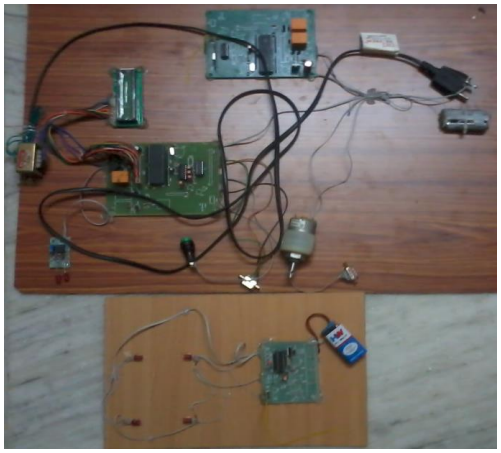
Whenever an accident occurs, it can be automatically known by the owner or his family members or concerned persons. For this purpose, we need to get a message. This will be sent to the owner of the vehicle or to his family members or concerned people by the GSM modem to the previously stored SIM numbers. These SIM numbers will be stored in the memory of the microcontroller. A message will be sent to these SIM numbers, which indicates an accident and also the area of occurrence in the form of latitudinal and longitudinal location. By viewing in the google map, the area or name of the location can be traced out.

The bumper switch which is placed on the vehicle initially lies in the open circuit mode. Whenever there is a heavy jerk or stress on it, the switch automatically gets pressed. This action lets the circuit to be in the closed circuit mode. Then, current passes through the circuit which is connected to the microcontroller. This change can be sensed by the micro controller to which a crystal oscillator is connected with a reset. Immediately, an indication will be sent to the LCD connected to the microcontroller. A beep sound is also produced. Now the micro controller uses the RS 232 and reads the latitudinal and the longitudinal location from the GPS modem and then sends this information to the GSM modem. From here, the location and accident occurrence indication will be sent to the previously stored SIM numbers.

VI. VI CONCLUSION

The output of the vehicle theft and tracking system can display both latitude and longitude values on the LCD and sends the SMS to respective numbers automatically, when the vehicle is being stolen. And also displays position of the vehicle with latitude & longitude values, even when an accident occurs. We can see the respective position on Google map by using these latitude and longitude values.

VII. KIT DIAGRAM



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